

## Claims

I claim:

1. A method for comparing features of a test record with features of a reference record, each feature having a location and orientation, comprising:
  - determining a weight for each feature of the reference record;
  - aligning the features of the test record with the features of the reference record;
  - measuring differences between the locations and orientations of the features of the reference record and the features of the test record; and
  - summing the weights of all features of the reference record that are less than a predetermined difference when compared with the features of the test record to determine a similarity score for the reference record.
2. The method of claim 1 further comprising:
  - comparing the features of the test record with a plurality of reference records to determine a plurality of similarity scores; and
  - selecting a particular reference record as a candidate reference record if the corresponding similarity score is greater than a maximum threshold.
3. The method of claim 1 further comprising:
  - extracting the features from images of fingerprints.
4. The method of claim 1 wherein the alignment is a rigid transformation including global translation and rotation.

5. The method of claim 1 wherein the alignment is a rigid transformation including only global translation to approximately align the features of the test record with the features of the reference record.

6. The method of claim 5 wherein a probability of matching features is represented by a zero-mean Gaussian function  $f(0; \sigma^2)$ , where  $\sigma^2$  is a variance of the function.

7. The method of claim 1 further comprising:

measuring differences only between pairs of features that are approximately aligned.

8. The method of claim 1 wherein the determining step further comprises;

identifying, for each feature in the reference record, a local neighborhood of features; and

setting the weight of each feature proportional to a function of distances between each feature and the local neighborhood of features.

9. The method of claim 8 wherein the distance function for weight  $w_i$  and  $k$

features in the local neighborhood is  $N \frac{D(d_i^1, d_i^2, \dots, d_i^k)}{\sum_{j=1}^N D(d_j^1, d_j^2, \dots, d_j^k)}$ .

where  $d_i^n$  is an  $n$ th distance of feature  $i$ .

10. The method of claim 8 wherein the distance function is an arithmetic mean.

11. The method of claim 8 wherein the distance function is a geometric mean.

12. The method of claim 8 wherein the distance function is maximum distance.

13. The method of claim 1 wherein the sum of the weights of the features of the reference record is normalized to one.

14. The method of claim 6 wherein the similarity score  $S$  for a test record  $T$  of  $M$  features and a reference record  $R$  of  $N$  features is determined by

$$S(T, F) = \frac{2}{(N + M)} \sum_{j=1}^M \sum_{i=1}^N w_i f(x_j - x_i; \sigma_x^2) f(y_j - y_i; \sigma_y^2) f_q(q_j - q_i; \sigma_q^2),$$

where  $x$  and  $y$  represent the location of the feature,  $q$  the orientation of the feature,  $w$  the weight of the feature, and  $f$  is a difference function.